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ONTARIO DEPARTMENT OF AGRICULTURE

Methods of Eradication of Some of the Noxious Weeds Of Ontario

COMPLIMENTS OF
FARMERS' INSTITUTE BRANCH

PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE
TORONTO, ONT., DECEMBER, 1905

Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty

NOXIOUS WEEDS OF ONTARIO

INTRODUCTION.

There is probably no question of greater moment to the farmers of Ontario than that of weeds. The greatest of vigilance is required to prevent their introduction; and acquaintance with methods and unceasing effort are necessary to their eradication. Reports from many sections throughout the province indicate that the farmers have slackened their efforts towards eradication during the past two seasons. The chief reason for this is that labor has been so very high that farmers hesitated to employ men at work that does not give some immediate return. Then, again, there are a few farmers in every locality who never have given much, if any, attention to the prevention of the spread of noxious weeds. This is discouraging to the farmer who has been making an effort to keep his farm clean.

The Department wishes to sound a note of warning that unless farmers use every care in the selection of their seed, especially the clover and grass seed, and also make an effort to prevent the further spread of weeds, the result will be most disastrous to the agriculture of the province.

In order that the farmers may be able to identify a number of the most troublesome weeds, and also be given information as to the most approved methods of eradication, it has been arranged that each deputation sent to Farmers' Institute meetings will be furnished with mounted specimens of weeds. These mounted specimens will be exhibited at each Institute meeting, and the information given hereon will be found of value to those who are making an effort to overcome one of the greatest enemies the farmer has.

It will be remembered that the Department published a weed bulletin in which were given cuts of some forty weeds. The supply is exhausted, but it is the intention to get out a revised edition at an early date. Those who wish to secure a copy of this may do so by applying to the Deputy Minister of Agriculture.

THE DESTRUCTION OF WEEDS.

By PROF. GEO. E. DAY, ONTARIO AGRICULTURAL COLLEGE, GUELPH, ONT.

One of the great secrets of success in fighting any class of weeds is to commence the fight as soon as the weeds appear, and not allow them to become well established all over the farm before any serious effort is made to eradicate them. When some of our worst weeds, such as wild oats, wild mustard, perennial sow thistle, bind weed, couch grass, etc., have become distributed all over a man's farm, it would cost almost the price of the farm to thoroughly eradicate them. If they are taken in time, however, the chances for keeping them in check are much better. In any case, efforts to keep weeds in check should never be relaxed, and while it may seem uphill work, at the same time well directed effort for a number of years will eventually lessen the number of weeds on the worst infested farm, though it is probable that more than a lifetime would be required to thoroughly eradicate them.

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Annual weeds, such as wild oats and wild mustard, have seeds of remarkable vitality, which will lie in the ground for years, ready to grow when given a favorable opportunity. After ground has been plowed, a large number of these seeds are brought up from the lower soil into contact with the air, and at once they germinate and grow in the crop which follows. After plowing, therefore, an effort should be made to grow some sort of hoed crop on the worst pieces, and see that none of these weeds mature their seeds. By thoroughly cultivating and hoeing throughout the season, most of the seeds in the upper layer of soil may be made to germinate, and then, before sowing a grain crop the following season, the ground should not be plowed, or, if plowed at all, not more than two or three inches deep. The aim should be to merely prepare a seed bed on the surface without disturbing the lower soil, and thus avoid bringing up fresh seeds to the surface. In a soil filled with the seeds of such weeds, deep plowing after a hoed crop practically undoes all that has been accomplished by the hoed crop. Sometimes, if a comparatively small part of the farm is infested with one of these weeds, two hoed crops can be grown in succession, which proves very effective. Thus, after the ground is plowed out of sod, it can be thoroughly cultivated until the latter part of June, and then sown with rape. After the rape has been pastured off with stock, the ground may be plowed, and the following season sown with another hoed crop, such as corn or roots, and if the cultivation of this crop is thorough, and care is taken not to plow deeply after the hoed crop, very few of these weeds are likely to appear in the succeeding crop. After the hoed crop, the ground may be sown with grain and seeded down again, and care should be taken that when it is next plowed up, a hoed crop should follow the plowing, so as to catch any seeds which may have escaped during the previous process.

Among the perennial weeds, there are some very bad ones, indeed, such as the perennial sow thistle, bind weed, and couch or twitch grass. To fight these weeds successfully, the best plan is to attack them during their period of most rapid growth, which is usually during the months of May and June. If the ground is plowed lightly in the spring, say about the middle of May, young plants will soon be seen appearing above the surface. To plow deeply at this stage is not very satisfactory, and if an implement can be secured which will cut all the young plants an inch or two under ground without disturbing the creeping root stalks below the surface, the plan will be found more satisfactory. Most of the manufacturers of ordinary spring tooth cultivators furnish broad points, which can be attached to the teeth, and which will answer very well for the purpose of cutting weeds. There is another type of cultivator, known as the scuffler. Cultivator, made by the Sylvester Brothers, of Lindsay, which also is supplied with very broad points, and which will do very satisfactory work in the cutting weeds. By cultivating with these broad points several times during the month of June, a very serious check will be given to the underground stems, and if the work is thoroughly done, it will be found that the weeds will be very much weakened. About the end of June, or just before haying, if the farmer does not wish to have his ground lie idle throughout the season, the ground should be sown with rape in drills, and cultivation with the scuffler maintained after sowing. If the ground is rich and the rape makes a rank growth, it will be found that most of these weeds will be very seriously injured by the rape crop, after being weakened by the cultivation described. When a field is badly infested with couch grass, however, it is almost impossible to get any implement which will cut the plants. Bind weed, sow thistle, and Canadian thistle are much more easily cut than couch grass, the young shoots of which are comparatively tough. As a rule, therefore, it will be found better to make an attempt to grub out a large number of the creeping root stalks of this weed by means of plowing, cultivating with the spring tooth cultivator, harrowing, and, if

necessary, using the horse rake. In this way, a great many of the root stalks can be raked up and carted from the field. By putting in all the time possible during the month of June at this work, couch grass can be very greatly weakened, and then by following this cultivation with a rape crop, such as has already been described, a very serious check can be given to this weed. If use cannot be made of rape, it would probably be advisable to summer fallow, continuing the methods of cultivation described throughout the season.

These are merely general suggestions, and represent plans that we have used with very good satisfaction on the College farm. Each farmer, however, will have to adapt his methods to his own peculiar conditions. The main point in fighting weeds is to study their peculiarities of growth, and then to adapt one's methods to meet the requirements of each case.

NOTES PREPARED BY H. H. MILLER, GUELPH, ONT.

ANNUAL SOW THISTLE, MILK THISTLE (*Sonchus oleraceus*). The annual sow thistle is a weed introduced from Europe. It grows from two to four feet high, has numerous heads of small pale yellow flowers, soft spiny leaves and fibrous roots. Its leaves are much more lobed than the Perennial or the Spiny-leaved Sow Thistle, both of which resemble it to some extent. The stems and roots are filled with milky juice.

It flowers from June to August and seeds from July to September.

It is dispersed chiefly by the wind, though it is usually introduced as an impurity in commercial seeds.

This weed is common in cultivated grounds and grows abundantly in neglected fields, which are under cultivation but are not producing a crop.

Continuous clean cultivation will easily keep this weed under control. Cultivate so as to prevent it from seeding, and follow hoed crops with grain and seed with clover.

MAY WEED (*Anthemis Cotula*). A leafy, branched annual with stem ter to twenty inches high. It has leaves cut into narrow segments and small heads of flowers with yellow centers and white rays. This vile weed with bitter taste and disagreeable odor was introduced from Europe, and is common in stockruns, waysides, and around farm buildings. Seeds are frequently found as impurities in grass and clover seed.

It should be cut or pulled up and destroyed before the blossoms open.

***WILD MUSTARD, CHARLOCK OR HERRICK (*Brassica Sinapistrum*).** A coarse, rough, annual plant, with a fibrous, branching root. The stem terminates in clusters of yellow flowers, of which the lower ones are the first to open, so that the pod appears on the lower part of the stem while the top is still in flower. The shape of the pod is characteristic, being constricted between the seeds, giving it a knotty appearance. The pods are from one to two inches in length, and average about seven seeds. The oat crop appears to be particularly favorable to the propagation of this mustard. It matures its seeds so that they are harvested with the grain, and is likely to be indefinitely propagated, unless care is taken to prevent it seeding, as the seeds, when once in the ground, will live for twenty years, and continue to germinate when brought near the surface.

A great deal of labor and a long time is required to get rid of this weed when once it gets possession of the land.

When present in small amounts, hand-pulling is the best method. If the seeds are formed they should be burned when dry. When fields are overrun the following is recommended: Harrow stubble ground early after harvest, as

*Specified in Seed Control Act.

soon as the seeds have had time to sprout, cultivate thoroughly and rib up with a double mould-board plow, the last thing in the fall. Put in a hoed crop (rape) the following spring, and cultivate thoroughly. Continue cultivation after the crops have been taken off, and rib up before the frost. Sow a crop of grain the following year and seed with clover.

Bluestone Treatment. Spray with a 2 per cent. solution of bluestone (blue vitriol or copper sulphate) which is made by dissolving one pound in five gallons of water, or nine pounds in forty-five gallons. It is necessary to spray the plants just when they are coming into bloom, and on a fine, bright day, in order to obtain the best results.

Vitality of buried seeds, 25 years.

***WILD OAT (*Avena fatua*).** The wild oat is an annual weed, with erect and smooth stems. It bears considerable resemblance to the common oat, but there are some distinctive points of difference. In the wild oat the chaff scales which adhere to the stem are thick and hairy, while in the cultivated varieties they are not so thick, and are hairless. The wild oat has a long, stiff awn, usually twisted near the base; in the cultivated varieties this is entirely wanting. It is also taller than the cultivated oat, and sheds its seeds before the latter is ripe. It seeds from July to August, and an average plant produces about 800 seeds. This seed is brought into new center, chiefly through the medium of cereal grains, but it also comes down at time of high water from infested fields to lower levels.

As to modes of combating the wild oat the following have been found effective. Cereal crops should be dropped out of rotation as far as possible for a time. If, however, it is necessary to introduce a cereal crop, barley is the most desirable. Some quick maturing variety should be secured which would ripen before the oat and should be cut before the oats have had time to mature.

Method practised at the O.A.C. as outlined by Prof. Day, is recommended for this weed.

Vitality of buried seeds, 4 years.

***CORN COCKLE OR PURPLE COCKLE (*Lychnis Githago*).** This is one of the weeds that infest our wheat crops. Its solitary purple flower makes it easily recognizable. It is an annual, flowering from June to August, and seeding from July to September. An average plant produces about 500 seeds, which are dispersed by birds, in manure, and as an impurity in seed grain, chiefly wheat.

The seeds are poisonous to young fowls.

It obtains a foothold in the land by being first sown as an impurity in wheat. It remains in the ground by seeding itself, for it ripens before many varieties of wheat, especially those sown in spring time, when the seeds tumble out of the large, ball-shaped pods, and thus seed the land.

To exterminate, the land should be cultivated so as to induce the germination of such scattered seeds as are lying in the ground, when the young seedlings which develop may be easily destroyed. As the weed is conspicuous, hand-pulling is one of the best methods of removing the cockle from the grain when it is not very thick. Care should be exercised in the selection of pure, clean, seed wheat, as this seed is easily distinguished, and this weed only remains because of carelessness and the neglect of reasonable precautions to remove it.

Vitality of buried seeds, 5 years.

***Cow COCKLE (*Saponaria vaccaria*).** This weed has not yet become common throughout Ontario, though it has become established in a few localities, and the writer found several specimens in the vicinity of Guelph during the past summer, which were introduced through the medium of the railways and seed

*Specified in Seed Control Act.

grain. These plants had produced seed and appeared to be well adapted to their new conditions. It is very abundant in the Territories where it spread with considerable rapidity.

It is a smooth annual, growing about two feet high with pointed opposite leaves which grow together at the base. Its flowers are pink and about half inch in diameter, giving place to seed pods within a fine angled calyx.

As to methods of eradication it may be successfully combated by planting the land with some crop that requires much cultivation. Late summer fall or plowing the field just as the plant is in blossom and before the seed has ripened, will also prove effectual. Should some plants appear the next season they should be pulled from the crop while in bloom, when they are easily distinguishable.

The seeds are usually found in wheat and care should be taken to ensure that seed grain is clear of it.

The seeds are twice as large as Wild Mustard and similar in shape and color. They may be distinguished from the seed of wild vetch which are about the same size by a slightly roughened surface while the latter is smooth.

***CATCHFLY (*Silene noctiflora*).** It is an annual, very leafy, and grows from one to two feet high, with a few creamy, white flowers. It has a viscid secretion all over its stem, often so profuse that the leaves and stem are covered with small insects entangled in it. The calyx have five awl-shaped teeth.

It seeds very abundantly and these are commonly found in grass and clover seed.

Time of flowering, July to September; time of seeding, July to October. Rotation of crops with careful cultivation will easily dispose of it.

***RAGWEED OR ROMAN WORMWOOD (*Ambrosia artemisiifolia*).** Ragweed with its divided leaves and long spikes of flowers is becoming very common in Ontario, and is doubtless known to most farmers. It is an annual and is a universal weed of grain fields in some sections. It reappears frequently, lowering the grain crop, and is one of a very aggressive character.

This plant flowers from July to September and seeds from August to November, an average plant producing about 5,000 seeds. It is dispersed by wind and water, being borne long distances by freshets and is frequently found as an impurity in clover seed, especially American Red Clover. Careful selection of seed is, therefore, an essential feature in the extermination of the weed. Special attention should be given to preventing the seed ripening. The ground should be cultivated at frequent intervals after harvest, until late in the fall, then plow or rib up and follow with a hoed crop. When in grass cover with a mower in September or October if the plants are likely to go to seed.

Ragweed, when eaten by cows, gives bitterness to milk.

Vitality of buried seeds five years.

DODDER (*Cuscuta epithymum*). During the past year especially there has been imported and distributed through this Province a comparatively new seed, known as dodder. Six species of dodder have been reported in Canada, one on flax, two on clover and alfalfa, and the others on various economic plants. *Cuscuta epithymum* is, however, the only one that has yet proven itself dangerous in Ontario.

Dodder is a plant that differs from the majority of plants in not being able to draw its nourishment from either the soil or air, but belongs to the parasites, or those plants which live upon the juices or reserve products of other plants. It does not produce leaves, but masses of yellowish or reddish stems which throw out haustoria (suckers) at points where they come in contact with the stem of the clover, and by fixing these sucking discs into the stems establishes a union which enables it to draw the juices of the clover.

* Specified in Seed Control Act.

in much the same manner as the rootlets of the common green-leaved plants draw their nutriment from the soil. When this union is effected the dodder plant disconnects itself from the earth but still continues to grow very rapidly, even more rapidly than the clover, and as this is always at the expense of the host the clover is soon killed. These leafless stems produce densely clustered white or pink flowers which are succeeded by rounded seed pods, each cluster producing about sixty seeds.

As to method of eradication, when small dodder-infested spots are first indicated by the tangle of yellowish or reddish stems referred to above, they should be mowed as closely as possible with a scythe several feet beyond where the yellow vines are observed. These spots should then be spaded, as the small clusters of flowers that produce nearly all the seed are near the root of the clover stem and will often remain in the stubble after the alfalfa has been cut and then ripen their seed. Where a field has become badly infested cultivation with hoed crops, such as roots or corn, for two successive seasons is usually successful, but rotation should be modified so as to leave out leguminous plants until the vitality of all seed remaining in the soil has been destroyed. These seeds will retain their vitality in the soil for five years or longer under favorable conditions.

***ERGOT** (*Claviceps purpurea*). This is a parasite which attacks grasses and cereal grains. In the heads of timothy, meadow fescue, wheat, or rye, may be noted dark purple-colored bodies known as ergots, occupying the place of some of the grains. They often stand out in a conspicuous manner in rye and many of the larger grasses, while in wheat and some of the smaller grasses they are not larger than the grains which they displace. Ergot contains poisonous compounds, and bread made from flour obtained from ergotted samples of wheat and rye has led to dangerous illness in human beings. This is, however, of rare occurrence. Abortion among cattle has been attributed to the consumption of ergotted grasses. If fed in considerable quantities, it will produce serious poisonous effects, but experiments indicate that there is little ground for the supposition that it will cause abortion.

It spreads by spores which when first formed contain a sweet secretion that is attractive to insects. This aids in their dissemination.

Meadows affected with ergot should be cut when the grasses are in bloom, before the fungus has had time to mature. Small patches of grasses in pastures are often much infested with ergot, in such cases they should be cut and burned. Couch or twitch grass is specially susceptible to this fungus.

Samples of cereal grains or grass seeds containing ergots should not be sown.

***FALSE FLAX** (*Camelina sativa*). This plant is a member of the mustard family and doubtless came to this country in imported flax seed. It resembles flax somewhat but has much smaller flowers and seeds, and its seed capsules, or pods, are pear-shaped instead of spherical, with a small projection from the upper end. It is an annual and winter-annual, growing from a foot to two feet high. It usually has branching stems, and narrow, arrow-shaped leaves. The flowers are numerous, yellow and somewhat inconspicuous.

The seed occurs as an impurity in flax and clover seed, and in some of the grass seeds, especially Timothy.

The fact that this plant ripens some of its pods early in the season and long before crops are ripe, renders it a difficult pest to overcome. Hoed crops may, however, be employed to the best advantage, as the cultivation given to these crops will induce the false-flax seed to germinate and thus clear the land.

Hand pulling is advisable when the weed is not too thick, and cutting down the whole crop before the seeds mature if the seed has been unwittingly intro-

* Specified in Seed Control Act.

duced with seed grain and the field becomes badly infested for the first time. Another method of eradication is to plow lightly as soon as the crop harvested. Harrow and cultivate frequently throughout the autumn to destroy the young seedlings. Grow a hoed crop the following year. The rotation crops should be modified in the infested fields by dropping winter wheat or for a time. Grass and clover seed should be sown along with the spring wheat or barley.

Vitality of buried seeds, five years.

TUMBLING MUSTARD (*Sisymbrium Sinapistrum*). This is one of the worst weeds in the Northwest Territory, and has recently been introduced into Ontario. Many specimens were found along the railroad track near Guelph and a considerable quantity of it has been introduced on the Massey farm near Toronto, through purchasing a quantity of an inferior quality of western wheat for poultry food.

The plant has a round, bushy nature, and breaks off when mature, near the surface of the earth. It grows from two to four feet high, and branches freely. The plant begins to flower early in the spring and continues to produce flowers, even after the harvest pods have begun to ripen, so that in the fall the whole plant is covered with them. Prof. James Fletcher, of Ottawa estimates by careful calculation that one well-developed plant contains 1,500,000 seeds.

An effective means of eradication is by hand-pulling, when possible, especially about the edges of fields and along roadsides. As it is an annual it can be easily eradicated by cutting with a hoe at the root, before the seed pods have formed and when the plant is still tender.

Good results may be obtained by preparing the ground thoroughly, and planting corn, potatoes, beans, turnips, or any other crop that will pay for thorough cultivation. The place should be watched for three or four years, however, to prevent the growth of plants from seeds that have lain dormant.

SHEPHERD'S PURSE (*Capsella Bursa-pastoris*). This is a winter annual, usually about one foot high. It bears small white flowers, which are crowded near the end of the branches. It has a long, deep taproot and the root leaves form a large rosette of leaves which lie close to the ground and in this state pass the winter. The seeds are borne in little, thin, triangular pods which resemble a purse in shape, from which the name of the plant is derived. This is divided down the center by a partition, forming two cells, each of which contains from ten to twelve seeds.

It flowers and seeds from early spring until winter. The seeds are frequently found as an impurity in grass seed, and it is also spread by birds. The Shepherd's Purse propagates only by seed and it cannot endure clean culture.

The best way to prevent its growth is to cultivate the ground and prevent it maturing its seed.

Vitality of buried seeds, five years.

***PENNY-CRESS, STINK WEED, FRENCH WEED** (*Thlaspi arvense*). No weed gives more trouble in the wheat fields of Manitoba than this, and it is becoming common in many parts of Ontario.

It is an annual and winter-annual, plants being found in bloom when the snow goes, and throughout the season. The plants that have wintered ripen early in June, and others before harvest.

It has a rank smell, dark green, smooth leaves, and clusters of small, white flowers which develop into flat, round, leaf-like pods. A pod contains about a dozen reddish-brown seeds, many thousands of which may be produced by one plant.

Hand-pulling is the best method to adopt when the area infested is small, but if that is not possible the land should be cultivated to cover what

* Specified in Seed Control Act.

seeds remain on the surface so as to cause them to germinate. The harrow should again be used when the young plants are just above the ground, the hotter the day this is done the better. Plants with fully-formed pods should never be plowed in, as the seeds will retain their vitality in the soil for a considerable time. They should, therefore, be mowed closely, and the weeds collected and burnt as soon as they are dry enough.

The seeds, when wet, are covered with a jelly-like coating, by means of which they adhere to any object with which they come in contact, and are thus distributed widely and easily, by sticking to the feet of animals and to farm implements.

Vitality of buried seeds, 8 years.

FLEA-BANE OR HORSE WEED. FIRE WEED (*Erigeron Canadensis*). An annual and winter-annual with much branched hairy stems from one to five feet high. Its flowers are in numerous, small, whitish heads, and its seeds are spread by the wind as they are small and light, with a pappus of short tufted hairs.

This weed is common in meadows and specially in uncultivated fields. As the stem is always strong and the root not large, hand pulling is a satisfactory way of dealing with it.

Good cultivation and the frequent breaking up of the land will easily keep it under control.

It flowers from June to September and seeds from July to November. An average plant produces 120,000 seeds.

***WHITE COCKLE (*Lychnis alba*).** Though this weed is not yet common in many parts of Ontario, it deserves attention on account of its dangerous character. It is a biennial and cannot readily be distinguished from the Night-flowering Catchfly. It has somewhat hairy, branching stems from one to three feet high. Like the Catchfly, it has a sticky secretion which attracts many insects.

The flowers are in loose panicles, white or pink in color and as a rule they open at night and remain so until the morning of the following day.

It flowers from June to September and seeds from July to October, an average plant producing 10,000 seeds. The seeds closely resemble Night-flowering Catchfly and Bladder Campion.

It has a fleshy branching root which is capable of producing new plants even under very unfavorable conditions. It grows most readily among hay and many rootstocks will produce two growths of plants, capable of ripening seed the same season. It is thus necessary to cut those plants at least twice a year to prevent seeding. No satisfactory method of eradication has yet been found, but a heavy seeding of rape followed possibly by a hoed crop the following season will do much towards exterminating this pest.

A sharp lookout for the seed when purchasing seed grain should be exercised to prevent its introduction.

***SWEET CLOVER (*Melilotus alba*).** Though this can hardly be classed as a noxious weed, yet it may be classed as a weed inasmuch as it grows where it is not wanted. It is rarely troublesome on cultivated grounds and is a soil former. It is a valuable plant in this respect, as it belongs to the clover family. But admitting its usefulness, the sweet clover is a coarse homely plant, and where permitted to grow and throw up its tall flower stalks unmolested, it is certainly offensive to the eye and neatness would demand its destruction.

When permitted to seed, the sweet clover does not live more than two years. Mowing off the flower stalks would prevent seeding, but as with common clovers it would tend to prolong the life of the root. The root, however, cannot endure cultivation, and a thorough plowing of the ground followed by a hoed crop will suffice to eradicate it.

***PRICKLY LETTUCE (*Lactuca Scariola*).** Is closely related to the common garden lettuce, which it resembles in the seed-bearing stage. It is an

* Specified in Seed Control Act.

annual or biennial. The stem, smooth or with small scattered prickles, rises to a height of two to six feet, and bears a large, open panicle of flowers or heads. The flowers are small and yellow, and each plant bears, on an average, 688 heads, 12 flower seeds to each head, and 8,256 seeds to each plant. The leaves, which are oblong and without stock, are prickly along the wavy margins and along the midrib on the back.

The plant begins to bloom early in July, and produces a few blossoms each morning thereafter until killed by the frost.

In the fruiting stage the tufts of a dozen seeds which grow in one head spread out so as to form a white ball of down, like that of the dandelion, which enables it to be rapidly spread by the wind.

The seed appears as an impurity in clover, millet and heavier grass seed, and the plant is, doubtless, most frequently introduced by this means.

It is also a host for a fungus which attacks the cultivated lettuce, which occurs on the leaves, forming dead-looking brown spots which spread until the whole leaf becomes dead and brown.

The remedy is to repeatedly cut the plants when they are at a good height and first begin blossoming. One cutting at this time will destroy the plants growing, but the plants succeeding these must also be remembered.

Under no circumstances should the mature seed-bearing plants be plowed under, as that would only fill the soil with seeds buried at different depths to be brought under conditions favorable to germination at intervals of several years.

MULLEN OR VELVET DOCK (*Verbascum thapsus*). This well known weed is a biennial growing from three to six feet high and is very common in waste places, road sides and gravelly and sandy pastures. It has a long, deep tap root from which springs a tall densely woolly stem, bearing woolly leaves and terminating in a dense cluster of bright yellow flowers. This weed flowers from July to August and seeds from August to November. An average plant produces about 6,000 seeds which are frequently distributed as an impurity in grass and clover seed. It is easily destroyed if cut below the crown with a spud in the fall or better still in early spring when the young rosettes may be more easily destroyed.

Breaking up the sod and growing hoed crops will readily dispose of it.

***BLUE WEED, BISHOP'S CURSE, BLUE DEVIL, BLUE THISTLE** (*Echium vulgare*). A biennial weed commonly known as Bishop's Curse in the County of Glengarry, where, according to legend, it is supposed to have been first introduced into America. The story goes that early in the history of the settlement the Bishop of Glengarry went over to Rome to visit the Pope. There he saw this flower in the gardens, and brought it home. It escaped from cultivation, and degenerated into a weed.

Whether this story is true or not, the fact remains that its ravages are greater in Glengarry than in almost any place it has been introduced.

During the first year the portion above the ground is a rosette of leaves, and from the centre of this, the next year, bristly, hairy and erect stems arise, one to two and one-half feet high. The flowers are arranged in a spike, and are a pure blue color. It seeds in the fall, and the seeds are dispersed chiefly in winter, when they are blown over the snow. An average plant produces about 3,500 seeds.

In arable land this weed seldom gives any trouble, as it cannot stand cultivation, but in rough, permanent pastures it becomes a serious pest. A permanent pasture once infested can only be cleaned by breaking up the land, and, as this would be practically impossible in some of our limestone ridges where this plant seems to be well adapted to growing, its spreading should be prevented by spudding whenever it makes its appearance in a new place.

* Specified in Seed Control Act.

Cutting below the ground with a spud is practically the only effective method of destroying the weed, unless rotation of crops can be practiced.

Vitality of buried seeds, 5 years.

*CANADA THISTLE (*Carduus arvensis*). The Canada thistle, or common thistle, is so well known that a description is hardly necessary. I may say that the so-called Canada Thistle is incorrectly named, as it was introduced from Europe, and is not a native of Canada. It is a hardy perennial, with creeping, underground stems or rootstocks which are fairly deep in the ground and are capable of sending up new shoots.

It flowers from June to August, and seeds from July to September, an average plant producing about 35,000 seeds. These seeds are provided with a pappus which enables them to be carried for long distances through the air. They are frequently found as an impurity in clover seed, and are also frequently disseminated by means of the threshing machine. In attempting to eradicate this weed great care should be taken to prevent its seeding. Where it occurs only in small patches, the thistle should be cut when in full bloom (July) as close to the ground as possible. By keeping the green parts cut above the ground, the rootstocks cannot receive nourishment, and will be starved out. The starving is a slow process, however, and, if employed, it must be persistent, and time allowed to operate.

Note method outlined by Prof. Day, if field is badly infested.

Vitality of buried seeds, 15 years.

*PERENNIAL SOW THISTLE (*Sonchus arvensis*). Though it is of comparatively recent introduction, its powers of multiplication and the tenacity of its hold upon the soil have rendered it one of the most widely introduced, and most unmanageable weeds in the Dominion.

The plant, as the name indicates, is a perennial, and grows from one to three feet high. The stems are hollow, somewhat rough, and are full of milky white juice. It has vigorous, underground rootstocks, which propagate buds, which in time produce plants. The leaves are deeply cut, thin and smooth; the flowers, which are produced in large heads at the top of the stem, are yellow and quite similar to the Dandelion.

As to eradication, note Prof. Day's method as adopted at the O. A. C.

Vitality of buried seeds, ten years.

*CHICORY OR WILD SUCCORY (*Cichorium Intybus*). A coarse, perennial weed, introduced from Europe, and becoming common as a weed of roadsides and fields.

The stems are almost leafless, from one to five feet high, and the stems and branches bear closely placed, bright blue flowers, which are usually closed by noon. The leaves spread out at the ground, and are long with irregular edges. The root is large and deep, and requires grubbing or close-cutting with the hoe. Its dried and ground roots are much used as a substitute for or an adulterant of coffee.

It flowers from June to October, and seeds from July to November, an average plant producing about 3,000 seeds.

It is often distributed as an impurity in clover seed.

The frequent use of the plow should easily subdue this weed, as the long tap root cannot stand cultivation.

BLADDER CAMPION (*Silene inflata*). This plant is, comparatively speaking, one of the latest of our new comers, but occasional plants may already be found in nearly every district in Ontario. It is a perennial and possesses long hardy root stocks. It grows from one to two feet high and branches from the base. It may be recognized by its white flowers and bladder-like calyx, the latter having a fine net work of violet-colored veins. The leaves are oblong and vary greatly in size, being much larger near the base of the stem.

* Specified in Seed Control Act.

The stem is smooth but coarse, and the whole plant is ashy gray in color. The seeds resemble those of night-flowering Catchfly and White Cockle and can rarely be distinguished with certainty by the most expert botanist. They may occur in clover or timothy seed and this weed is also dispersed by means of its running rootstocks.

It flowers from June to August and seeds from July to September. An average plant produces about 9,000 seeds.

The method of eradication of this weed is practically the same as for the other creeping perennials and I would, therefore, recommend the method as outlined by Prof. Day.

***OX-EYE DAISY, WHITE DAISY (*Chrysanthemum Leucanthemum*).** The stems of ox-eye daisy, of which several often grow from the same root stock, are one to two and one-half feet long, and terminate in brilliant flowers with bright yellow disks and white rays. The ox-eye daisy propagates itself by seeds, of which an average plant produces about 7,000, and also by hardy creeping underground rootstocks. It starts up in the spring about the same time as the grasses, and ripens about the same time as timothy, and later than clover. A very good method of preventing it from spreading is to cut the hay early, and thus prevent the ripening of the seed.

If the daisies are cut within ten days from the date of the opening of the blossom there is no danger of the seed being mature enough to germinate. Cutting the stems before the plants seed will prevent seeding, but will not destroy the plant nor prevent spreading of its rootstocks. Ox-eye daisy cannot, however, stand cultivation, and thorough and systematic cultivation, together with a good dressing of manure, will usually dispose of it. It may be of interest to know that as far as chemical composition goes the ox-eye daisy is fully the equal of timothy hay in its nutritive constituents, but when its digestibility and palatability are taken into account, its comparative value is much depreciated.

The seeds are frequently found as an impurity in timothy seed. Vitality of buried seeds, 5 years.

***ORANGE HAWKWEED OR PAINT-BRUSH (*Hieracium aurantiacum*).** The orange hawkweed or paint-brush is already introduced into many parts of Ontario, and, unless checked, will spread. It is the worst weed known in certain portions of the eastern townships in Quebec and Vermont state. It is a native of the mountainous regions of Europe, and has been introduced into this country as a garden flower. It is capable of rapid adaptation to varying conditions, and thrives equally well in all soils, from sandy loam to heavy clay, and at all altitudes. Its further spread may, therefore, be expected.

The plant is easily recognized by its peculiar, hairy leaves and stem, and especially by its conspicuous orange-red blossoms. It is a perennial, and propagates itself rapidly by means of runners at the base, and by seeds. The flowers are about the size of a silver quarter of a dollar, and are borne in clusters of five to twenty or more, and on a nearly leafless stem, one to two feet high. An average plant produces about 1,200 seeds, and a careful examination of a single plant has shown that nearly thirty new plants may originate by runners from an old one. The seeds like those of the dandelion are provided with tufts of hairs, which aid distribution.

In all cases where there is only a small amount of the weed present, common salt is the quickest and surest means of destroying it. Eighteen pounds per square rod, or 3,000 pounds to an acre, will destroy every plant, and will be beneficial to the grass. With this weed, pulling by hand is a waste of time. Numerous runners and rootstocks will be left in the ground, and it will only give the weed a temporary setback. The hawkweed readily yields to careful plowing, followed by thorough cultivation. It is recommended

* Specified in Seed Control Act.

that the land be left in cultivation for two or three years, and planted with some hoed crop, as the plants may be kept down during the entire season, and thus prevent seeding.

***CURLED DOCK** (*Rumex crispus*). This is a rank, coarse, deep-rooting, perennial weed. The rather slender, somewhat grooved, branching stem grows to a height of three or four feet and terminates in a plume-like raceme of greenish flowers, which are followed by shining, angular, brown seeds, shaped somewhat like a kernel of buckwheat. The leaves are from six to ten inches in length, with wavy margins, hence the name, "curled dock." This plant seeds from July to November, and is a very common impurity in red clover. An average plant produces about 17,000 seeds. The winds act as an agency in scattering the seeds, as they are winged, and capable of being carried long distances in this manner.

This is not a really bad weed, as it can be kept in check by the introduction of hoed crops in rotation. The later-sown hoed crops, as rape, are more effectual than those sown earlier in the season. When the soil is wet, hand-pulling is, perhaps, the most effectual, as the root will usually come out almost entire. The more common method of cutting of the stem with the scythe or hoe does not destroy the root. It is one of the few plants whose roots have the power of producing adventitious buds. When these are present, each piece of dock root when cut up is capable of producing a shoot, and thus behaves like a rhizome or tuber.

FOXTAIL, YELLOW-FOXTAIL, PIGEON GRASS (*Setaria glauca*). This is a very common weed in cultivated fields, and will spring up where any vacant space is left. It grows from one to two feet high and has a bulbous and perennial root stock. The leaves are much like those of timothy and other grasses, but are rough and have a fringe of hairs along the edge. The close spike or head resembles millet and is tawny yellow in color.

It flowers from July to September and seeds from August to October. An average plant produces about 15,000 seeds. These seeds are flattened on one side, about three times the size of timothy seed, and vary in color from straw to brown, and not infrequently retain their green color. They are commonly found as an impurity in clover and millet seed. Clean cultivation so as to prevent the formation of seeds is required in subduing this grass. Its seeds are doubtless stored up in most soils, but if only clean seed is sown and proper rotation of crops practiced no trouble will be given by foxtail.

***RIBGRASS, PLANTAIN, BUCK-HORN** (*Plantago lanceolata*). Ribgrass is becoming very common in clover seed and in many sections of Ontario is proving very troublesome. It has a perennial root and a rosette of narrow leaves, six to ten inches long, growing on the ground in a cluster at the root. The flower stocks are from six to eighteen inches long, without leaves, and terminate in a dense spike. The seeds are brown and shining with hollow groove on inner face. It seeds from July to October and an average plant produces about 1,200 seeds. It is a specially bad weed when it appears in lawns, as it will cover the ground with a mat of leaves.

The weed may be eradicated by cutting below the ground with a spud if the plants are not too numerous. If they are, the usual method, cultivation and rotation of crops must be resorted to.

Great care should be exercised by farmers in purchasing Red Clover seed, as a large percentage of Red Clover contains seeds of this weed. It is also commonly found in lawn mixtures.

Vitality of buried seeds, seven years.

***COUGH-GRASS, QUACK-GRASS, TWITCH-GRASS** (*Agropyron repens*). Couch-grass has some excellent qualities as a fodder plant, as it is said to surpass timothy

* Specified in Seed Control Act.

in nutritive value, but its disposition to monopolize and retain possession of the soil, renders its destruction one of the most serious problems the farmer has to face. This weed grows from one to three feet high, from an extended, jointed rootstock, bearing spikes from three to ten inches long. Any stems which happen to get cut by a plow, harrow, or hoe, will send up a stem and leaves from any joint it may have, and produce a plant. Thus care should be taken in preventing their distribution by farm implements.

In eradicating this weed not only must the seed be prevented from maturing, but the creeping rootstock must be starved out and destroyed.

The method to be employed, will, as in the case of many other plants be determined by other circumstances. In a farm that is free from the weed, when a patch is first discovered, it should be destroyed, either by digging with a spade, and burning, or it may be smothered out by covering with straw, sawdust, or manure mulch.

Where it has become established, the method outlined by Prof. Day is recommended.

GREAT RAGWEED (*Ambrosia trifida*). A native found mostly in heavy clay land. It is a rough, coarse, annual weed which sometimes attains a height of five or six feet. Its leaves resemble in shape those of maple, and are set opposite each other on the rough, hairy stem. The flowers are of two kinds, the male or sterile flowers borne on tapering spikes about four inches in length, and the female flowers (which produce the seed) grow close to the stem in clusters of from one to three together at the bases of the spikes and leaves. Its seeds, which are about the size of a grain of wheat, are very objectionable, as it cannot be readily cleaned out of seed wheat, and renders it unsaleable. These seeds ripen in September and October, and an ordinary plant will produce about 6,000 seeds. It is distributed chiefly as an impurity in wheat, and is also frequently disseminated by freshets, as it often grows along the banks of rivers.

Ragweed cannot make much headway when clean seed is sown and a good system of rotation of crops is practiced. As the plants are conspicuous, hand-pulling should be practiced when any stray specimens are noticed.

Vitality of buried seeds, 5 years.

SQUIRREL-TAIL GRASS OR WILD BARLEY (*Hordeum jubatum*). Squirrel tail is an annual or winter-annual from six inches to two feet high, producing fibrous roots. It grows best in moist ground, is erect, and has a glistening appearance. This plant has a wonderful capacity for stooling, and a single plant often produces forty spikes, which bear from three hundred to two thousand mature seeds.

The plant is admirably adapted to be scattered by animals, also by wind and currents of water. The awns are barbed upwardly and readily cling to the fleece of animals. Water, too, helps to scatter the seed, especially freshets in the spring and autumn. Railroad cars in transit, having live stock, often carry the seed. The specimens contained in the collection were secured near the station of Milton, Ont., where there had been some straw dumped from a car containing Western cattle.

There is no question regarding its injury to meadows and pastures, but more serious than this is the injury to the stock. Dr. D. H. Johnson, of the U. S. Department, writes as follows: "The grass when found in hay and allowed to ripen, if in any quantity, is very injurious to horses' mouths. The small awns seem to work in and cause deep ulcerating sores which form under the tongue and lips. The writer has seen a great many animals affected, and made a careful examination, and found these seeds deep in the flesh, where they remained for three months or more. Have seen lips eaten completely through, and tongues eaten almost off by this grass. As to cattle, I have seen some affected, but not to such an extent, because the mucous membranes are much thicker."

To prevent it seeding, frequent cutting is effective. It should be cut young, as the seed, though not mature, is capable of germination. Rotation with cultivated crops may be used with this as with other annuals.

WILD CARROT (*Daucus Carota*). Wild carrot is a biennial which grows from three to four feet high and has a bristly stem and much divided leaves, like the cultivated carrot. The ends of the branches bear white flowers, which appear from June to September and they are followed by contracted, cup-shaped clusters of burr-like seeds. These seeds are readily attached to passing animals and are distributed in that way, or they often remain undisturbed until winter and are then blown across the snow. They are frequently found in poorly cleaned grass and clover seed. The seeds are covered with a hard, spiny coat which resists the weather and may lie dormant in the soil for several years without losing their vitality.

As the root is a biennial, prevention of seeding for two seasons would eradicate it. As the plant sends out flowers from the base after haying, a single cutting would not prevent seeding, and it should be mowed again before the second blooms are matured enough to form seeds. They will continue to branch from the base after each cutting until finally exhausted, so that the first mowing will often appear to increase rather than diminish their numbers. The root may be cut off with a spud some distance below the surface of the ground, a process that usually kills it at once.

When a field becomes badly infested, it should be plowed and cultivated and a hoed crop grown thereon.

CINQUEFOIL (*Potentilla Norvegica*). This weed is commonly found in meadows and is a general indication that the land needs enriching. The seeds resemble timothy somewhat and are frequently found in timothy and red-top seed. It has bright yellow blossoms, leaves three-parted, and the whole plant has a dark green, hairy appearance. The small yellow flowers are borne in clusters at the ends of the branches. It has a somewhat deep, rough perennial root-stock, and spreads by runners as well as by seeds. It belongs to the same family as the strawberry and its leaves are very similar to the strawberry leaf.

An application of manure or fertilizers, or a shorter rotation of crops will be found useful where cinquefoil is frequent, as it may easily be smothered out by the growth of forage plants.

TOAD FLAX, BUTTER AND EGGS (*Linaria vulgaris*). This weed was doubtless introduced into Canada as a garden flower. The toad flax is a perennial and is propagated both by its seed and by its creeping rootstocks. It inclines to form a large patch and so far as it extends, takes almost exclusive possession of the soil.

The plant grows to a height of one to two feet, and has dense clusters of showy, yellow flowers at the top of the stem. These are succeeded by pods divided into two cavities, which are filled with light, winged seeds easily carried by the wind.

Thorough cultivation is the only treatment which is likely to be effective, as the roots are very numerous and persistent.

***BINDWEED (*Convolvulus arvensis*).** This perennial has earned the name of being one of the worst, if not the worst weed, to eradicate that has yet been introduced into the Province. Its tough, curling stems grow several feet in length and wind themselves around the plants, partially choking them and hindering their growth. Underground it has extensive, creeping roots, or stems, which often descend so deeply into the soil as to be beyond the reach of ordinary tillage implements. Any pieces of these roots will produce new plants, so that to prevent them spreading, great care should be exercised to

* Specified in Seed Control Act.

prevent their being dragged by the cultivator or harrow to parts of the field not already infested. It spreads chiefly by the rootstocks as the plant rarely produces seeds freely. Where the conditions are favorable to the production of seeds, however, an average plant will produce about 160 seeds. These are poisonous to cattle and grow in rounded capsules with from three to four seeds in each. They are occasionally found as an impurity in cereal grains and are also carried from place to place by the agency of water.

It flowers from June to October and seeds from August to October.

This weed usually appears first in small patches and if taken in time may be treated successfully with little outlay.

Covering the plants with tar paper has been found effective as this will prevent the leaves developing, and the store of food in the net work of roots, which are frequently much larger than the stems above ground, becomes exhausted, and the plant dies.

Buckwheat sown on summer fallow and plowed under when coming into bloom, and followed by surface cultivation with broad share cultivator has given satisfactory results in instances known to the writer.

Spudding and forking out small patches when they first make their appearance is, however, the surest and safest method to adopt. The ground must be dug as deeply as the roots extend and all the roots must afterwards be raked off and burned. The success of such treatment depends entirely upon thoroughness and perseverance, as careless spudding will only tend to increase their vigor and aid in spreading the weed.

For general treatment of any considerable area the method outlined by Prof. Day may be followed.

The spread and propagation of all perennials is effected in much the same manner, consequently the same method of eradication will apply, although, if possible, greater thoroughness should be practiced in the treatment of this weed.

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